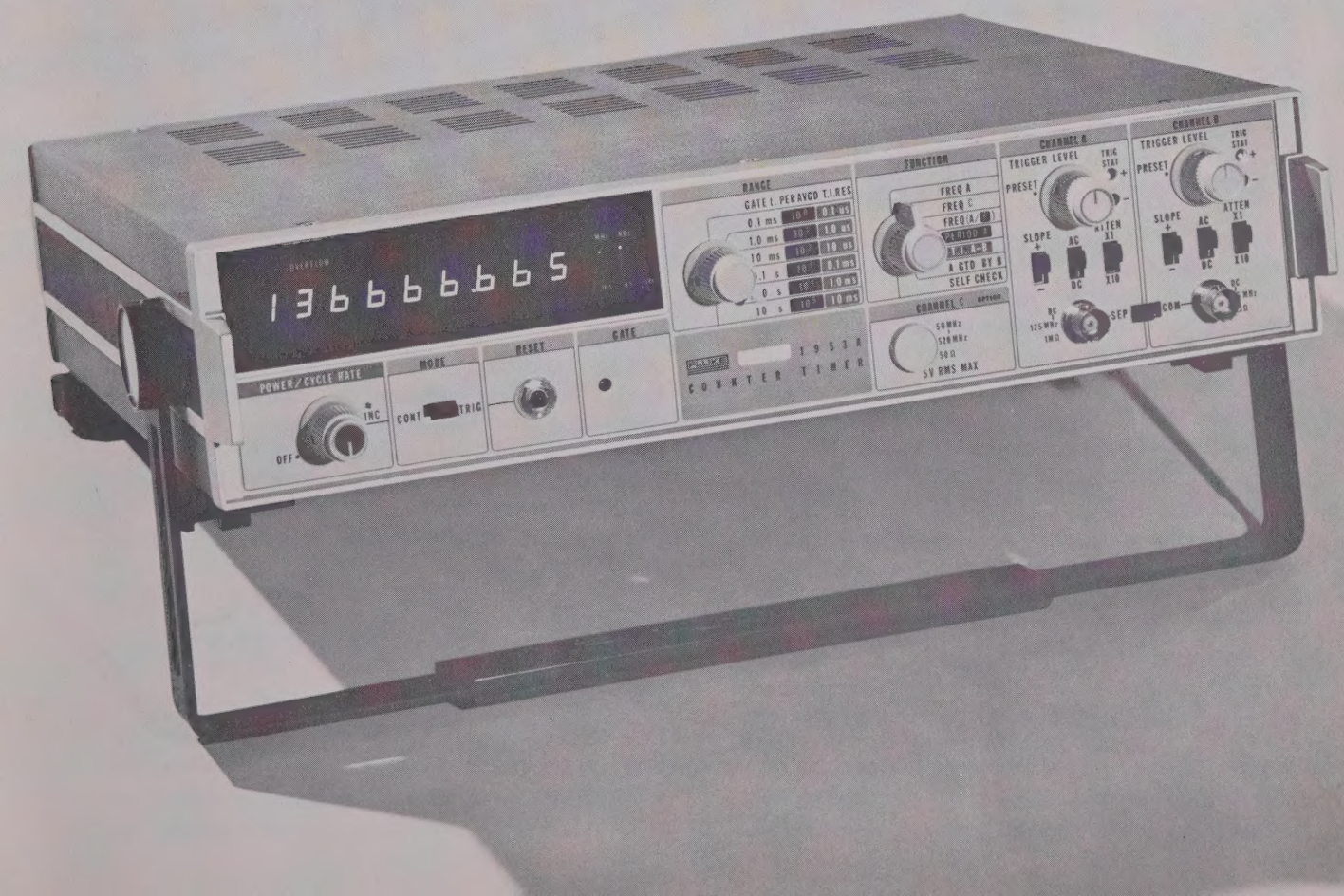
application bulletin

FLUKE®

ab-23

REMOTE CONTROL AND DATA OUTPUT FOR THE FLUKE 1953A UNIVERSAL COUNTER-TIMER USING THE IEEE STANDARD 488-1975 INTERFACE BUS (OPTION-15).



GENERAL

This interface permits interconnection with bus compatible Fluke instruments and equipment of different manufacturers having the standard interface. The Fluke IEEE counter option is intended for systems application where bus management and data manipulation is performed via a system controller (terminal, calculator, computer, etc.). The counter can also be manually operated without the use of a controller displaying measurement information locally and outputting data (talk only mode) directly to a printer, display terminal or other peripheral device (listener).

The 1953A Option -15 is directly compatible with the IEEE interface standard using the preferred ASCII (U.S.A. Standard Code for Information Interchange) character-serial, seven bit code set, although other codes (binary, BCD, etc.) may be used assuming that compatibility exists between devices.

Interface driver and receiver circuits are all TTL compatible.

This option permits the full remote operation of the counters front panel controls and switches (FUNCTION, RANGE, and signal conditioning) excluding the POWER ON/OFF switch.

Output information available from the counter-timer's interface is comprised of 9 digits of display data plus decimal point and the exponent for frequency or time units. Overflow indication is provided when the numeric capacity (10^9) of the display has been exceeded.

Two internal D/A converters are included for remote programming the A and B channel trigger levels each providing a 1% resolution.

PROGRAMMING

To instruct the counter to go from LOCAL to REMOTE operation, an ASCII address character is sent from the controller keyboard. After this address, a terminator character (depending on the controller type) is sent and the counter transfers into the REMOTE operation. A "REMOTE" LED on the counter's front panel is now illuminated.

When in the REMOTE mode, the counter's front panel controls are locked out and do not respond to manual operation.

After terminator characters are transmitted, the counter can be considered a "listener" and it is ready to be remotely initialized to the appropriate function, range, and signal conditioning settings for the desired measurement.

The following shows all characters used by the 1953A-15.

A	B	C	F	G	H	L	M	R	S	T	X

Ø	1	2	3	4	5	6	7	8	9	+	−	,(Comma)	.(Period)

All other characters are ignored by the counter interface.

The following 31 primary addresses can be selected by switches on the interface card at the rear panel of the counter

ALLOWABLE LISTEN AND TALK ADDRESSES

DECIMAL	5 4 3 2 1 BINARY	ASCII CHARACTER LISTEN	ASCII CHARACTER TALK
0	0 0 0 0 0	SP	@
1	0 0 0 0 1	!	A
2	0 0 0 1 0	"	B
3	0 0 0 1 1	#	C
4	0 0 1 0 0	$	D
5	0 0 1 0 1	%	E
6	0 0 1 1 0	&	F
7	0 0 1 1 1	'	G
8	0 1 0 0 0	(	H
9	0 1 0 0 1	)	I
10	0 1 0 1 0	*	J
11	0 1 0 1 1	+	K
12	0 1 1 0 0	,	L
13	0 1 1 0 1	−	M
14	0 1 1 1 0	.	N
15	0 1 1 1 1	/	O
16	1 0 0 0 0	0	P
17	1 0 0 0 1	1	Q
18	1 0 0 1 0	2	R
19	1 0 0 1 1	3	S
20	1 0 1 0 0	4	T
21	1 0 1 0 1	5	U
22	1 0 1 1 0	6	V
23	1 0 1 1 1	7	W
24	1 1 0 0 0	8	X
25	1 1 0 0 1	9	Y
26	1 1 0 1 0	:	Z
27	1 1 0 1 1	;	[
28	1 1 1 0 0	<	\
29	1 1 1 0 1	=	]
30	1 1 1 1 0	>	Λ

As an example, suppose a functional check of the counter is required using the SELF CHECK feature with a GATE time of 1 second. All that is required to be sent from the controller keyboard are the address characters, F6R4, and a terminator character. F6 is the SELF CHECK function (F = FUNCTION) R4 is a 1 second GATE time (R = RANGE). The 1953A now displays 10000000 Hz after a 1 second gate time.

The following table lists the available function and range codes for the 1953A.

FUNCTION	CODE		RANGE		CODE
		Gate	Per Avg	T.I.Res	
FREQ A	FØ				
FREQ C	F1	0.1ms	10^0	0.1µs	RØ
FREQ A/B	F2	1.0ms	10^1	1.0µs	R1
PERIOD A	F3	10.0ms	10^2	10.0µs	R2
TIME INTERVAL	F4	0.1s	10^3	0.1ms	R3
A GATED BY B	F5	1.0s	10^4	1.0ms	R4
SELF CHECK	F6	10.0s	10^5	10.0ms	R5

In many sinewave measurements, the counter's trigger level can be left in the PRESET or zero level position.

Assuming that this is the case, then the following example shows the simplicity for programming the counter.

Example 1 - FREQUENCY MEASUREMENT

To measure a frequency using a 1 second gate and output the result to terminal:

Listen Address - FØR4 - Terminator Character - Talk Address

(Listen and Talk Addresses are Device Dependent)

For more specific signal conditioning such as attenuation, coupling and trigger slope selection, the following additional code commands may be used.

TRIGGER FUNCTIONS CHANNEL A	CODE
Positive Slope	A+
Negative Slope	A–
AC Coupled	AØ
DC Coupled	A1

The above functions may be combined; e.g., A + 1 or A1+ . (Channel A, Positive Slope, Directly Coupled).

TRIGGER LEVEL CHANNEL A	CODE
Trigger Level at + X.X Volts	LA + X.X (where X = Ø to 9)
Trigger Level at –X.X Volts	LA – X.X
Trigger Level at + .XX Volts	LA + .XX
Trigger Level at – .XX Volts	LA – .XX

Only two digits may be given as indicated by .XX or X.X. In ±X.X the X10 attenuator is in operation.

If only one digit is sent; e.g., LA + 1 or LA1, a terminator has to end the string. If two digits are already sent, the terminator is ignored. A comma should be used as the terminator.

For CHANNEL B programming, the same rules apply as in CHANNEL A with the substitution of B for A.

COUPLING CHANNEL A AND CHANNEL B	CODE
Channels A and B Separated	SØ
Channels A and B Common	S1

Example 2 - TIME INTERVAL MEASUREMENT

REQUIRED: It is desired to measure the time between pulses on Channels A and B using a 1 μs time interval resolution. Channel A is programmed to be directly coupled with a negative slope, and triggered at a –2.7V level. Channel B is programmed to be directly coupled with a positive slope, and triggered at a +0.85V level. With the appropriate listen and talk addresses, the following sequence will provide the counter control settings.

CODE: F4R1A-1LA-2.7B1LB.85SØ

Note that all device dependent messages can be sent without separation or delimiting characters. Also, code items may be entered in any sequence.

INTERPRETATION:

F4	(Time Interval)
R1	(1 μs Resolution)
A-1	(Channel A, Negative Slope, Directly Coupled)
LA-2.7	(A Trigger Level at -2.7V)
B1	(Channel B, Positive Slope, Directly Coupled)
LB.85	(B Trigger Level at +0.85V)
SØ	(Channels A and B Separate)

OUTPUT ONLY IF ADDRESSED CODE MØ

In this mode after a measurement has been completed, the interface will output a result only if it is addressed as a talker. If not, a new measurement will commence when in the continuous (CONT.) mode HØ, or it will wait for a trigger command Code T when in the TRIG. or hold mode (H1).

WAIT UNTIL ADDRESSED AND THEN OUTPUT CODE M1

When a measurement has been completed in this mode, the interface places a "service request" on the bus (SRQ). The counter waits until addressed as a talker and then transmits the result. A new measurement is started if in the CONT mode (HØ), or the counter will wait for a trigger command Code T if in the TRIG mode (H1). In the TRIG mode, the last reading will be retransmitted if the interface receives a Code X.

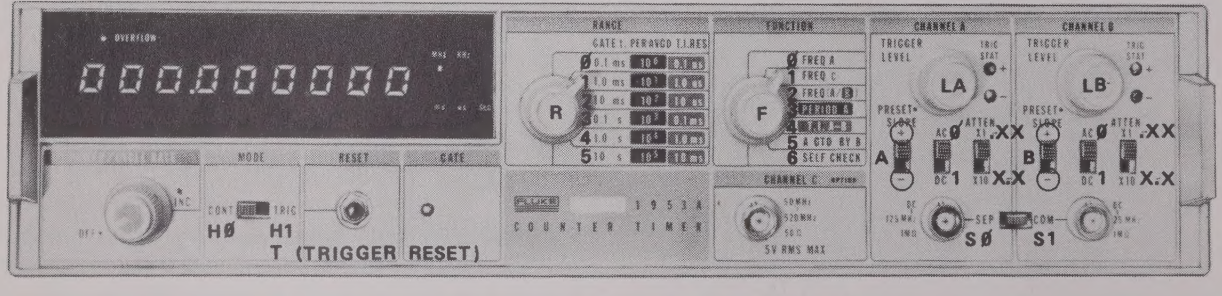
CLEAR COMMAND

A "Clear command" Code C initializes the counter to FØ, RØ, A + Ø, B + Ø, LA.ØØ, LB.ØØ, SØ, MØ, HØ which corresponds to a typical starting condition when the counter is first switched on in the manual operation. This initialization is where the RANGE, FUNCTION and TRIGGER LEVEL controls are fully counter-clockwise, all vertical slide switches to the "up" position, and horizontal slide switches to the "left-hand" position.

GET STATUS COMMAND

Counter status data may be obtained if addressed as a talker when character G is transmitted from the controller. The status response indicated will be one of the following combinations:

GATE OPEN	OVERFLOW	COUNTER BUSY	SERVICE REQUEST	STATUS	SERIAL POLL STATUS
NO	NO	NO	NO	0	!
NO	NO	NO	YES	0	a
NO	NO	YES	NO	1	#
NO	NO	YES	YES	1	c
NO	YES	NO	NO	2	%
NO	YES	NO	YES	2	e
NO	YES	YES	NO	3	,
NO	YES	YES	YES	3	g
YES	NO	NO	NO	4	)
YES	NO	NO	YES	4	i
YES	NO	YES	NO	5	+
YES	NO	YES	YES	5	k
YES	YES	NO	NO	6	–
YES	YES	NO	YES	6	m
YES	YES	YES	NO	7	/
YES	YES	YES	YES	7	0



Where X = Ø to 9

C Clear and initialize (RØFØ A + Ø B + Ø LA.00 LB.00 SØ MØ HØ)
G Get status (addressed as a "talker")
MØ Output only if addressed
M1 Wait until addressed then output
X Retransmit last reading (only in H1 or M1)

MP MASTER
MA35514

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